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**CURRICULUM PROJECT**

1. **Introduction**

According to the National Center of Education Statistics, Rhode Island was one of four states that showed significant improvement in its’ math scores both at the elementary and middle school level, on a rigorous national test, National Assessment Education Progress (NAEP), administered on 2009. However despite the gains, the state’s middle school scores continue to lag the national average, and gaps persist among white, black, Hispanic, and low income students. (National Center for Education Statistics, 2009).

According to the New England Common Assessment Program (NECAP) results in 2008-2009, in Rhode Island, 11,000 students -27.0 % of high school juniors- were proficient in math, about 5,000 students scored substantially below proficient – 45 %. If the state were using the set of regulations that start in 2012 all those students would be at risk of not graduating because of their low test scores. Therefore, In general the mathematic achievement is far away from where it should be (Jordan, 2009).

Causes are numerous and diverse, state school officials do not blame students alone. Some of the cause goes to the schools that haven’t ratcheted up classroom instruction to keep pace with the rigorous state expectations. The last two summits for mathematics and science at the State pointed to the lack of deep knowledge among some teachers that make impossible for them to help students reach standards (Borg, 2009). Providence’s Mayor David Cicilini, indicated that one of the reasons why the NECAP scores in Rhode Island are the lowest among the states is because the differences here compared with the other two states that are clearly more rural and suburban.

In order to improve Providence Schools, the District working together with the Dana Center developed a uniform program for math and science called “District Curriculum Framework”. The purpose of the new curriculum is to strengthen instruction through pacing guides that address all the State and District standards. The goal of the District is to increase student achievement, by at least 70% of all students attaining achievement proficiency levels 3 or 4 on NECAP by the 2011–2012 academic year.

This paper analyzes the NECAP scores for mathematics during 2008-2009 year. The grades examined are 5th, 7th, and 11th. Information of three schools is used as sample of the performance across the District. The intention of the analysis is to find the area where student’s performance is weak and from there, suggest modifications to the high school mathematics curriculum.

1. **Individual Professional Development Plan**

This paper develops an inductive analysis of the behavior of the strands using NECAP - Item Analysis Report in three different levels. The graph below starts the analysis indicating that the scores of the District tend to decrease in the strand Number & Operations as students move to higher grades. From an 11% of correct answers in 5th grade, to 6.1% in 7th grade, and finally to 0.8% in 11th grade.

**Source: Fall 2008, NECAP Test Item Analysis Report**

For the other strands Geometry & Measurement and Data, Statistics & Probability there is no visible pattern. In the strand Functions & Algebra the scores improve along the students move to higher grades. This tendency can be explained due to the major emphasis in Algebra in the higher grades. The graphs below, show similar behaviors using the parameters at District Level and State Level. With the same idea through the school years, the amount of time spent on Number & Operations decreases and the types of numbers studied change.

**Source: Fall 2008, NECAP Test Item Analysis Report**

**Source: Fall 2008, NECAP Test Item Analysis Report**

A comparison between the scores on three sample schools and the scores of the district throw an average error lower than 0.2%, which suggests that the sample provides a good representation of the District’s performance. Since scores’ vary in each one of the other three strands: Geometry & Measurement, Functions & Algebra, and Data, Statistics & Probability from elementary to high school are not as significant compared to the variation in the strand Numbers & Operations. This paper concentrates its analysis in this last strand to seek complementary ways to improve the current curriculum at high school level and reach higher scores in the following NECAP examinations.

Problems in math instruction are systemic most of the time; students who struggle with math in elementary or middle school find their problems compounded over time at high school. The behavior of the NECAP data for the strand Number & Operations indicates a different tendency. Students have problems keeping the proficiency reached in elementary when they move up to middle school and later to high school. The outcome affects the others strands too because the strand Number & Operations is cornerstone for the study of mathematics. Students need to use numbers to quantify sets, identify location, measure, quantify the probability of an event, analyze data, and describe and interpret real-world phenomena. The solution should require change(s) in the way how this strand is taught, learned, and practiced.

As an educational leader, my position advocates for a common vision in math instruction based in clear expectations, shared understanding of different levels of rigor, and flexible alignment of programs to prepare all students for college-level work. This paper uses multiple sources of information to analyze data about current practices in the subject to shape future outcomes that involve students and educators. My position matches better with Rhode Island Leadership Standards 1 and 2, respectively “Education leaders ensure student achievement by guiding the development, articulation*,* implementation, and sustenance of a shared vision of learning and setting high” and “Education leaders ensure the achievement and success of each student by monitoring and continuously improving learning and teaching”. (Rhode Island Department of Education, 2008).

1. **School/Classroom Assessment**

In order to have a better understanding of where the extra efforts have to be directed, this paper continues the analysis of the NECAP Item Analysis Report question by question as part of the school assessments, at grades 7th and 11th . Questions that belong to the strand Numbers & Operations are highlighted. The tables below identify depth of knowledge, percent of students with correct answers, percent of students with incorrect answers, Grade Level Expectations/ Grade Span Expectations, and it introduces a column for error analysis that considers students’ possible difficulties to answer the question(s).

**NECAP Question Analysis Grade 7**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Release Item** | **Strand** | **DOK** | **% of Students with Correct**  **Answer** | **% of Students with Incorrect**  **Answer** | **Grade Level Expectation**  **Students…** | **Error Analysis**  **Students…** |
| 1 | N&O | 2 | 44 | 56 | 6-1  Understands rational numbers with respect to ratios | * Had difficulties relating two variables in order to get the ratio. |
| 2 | N&O | 2 | 19 | 81 | 6-2  Demonstrates understanding of the relative magnitude of numbers | * Had difficulties doing operations with fractions and mixed numbers. |
| 3 | N&O | 1 | 76 | 24 | 6-3  Understanding of math operations with fractions and integers | * Had difficulties with exponents and breaking down numbers into prime multiplication. |
| 4 | N&O | 2 | 44 | 56 | 6-4  Solves problems involving fractions, decimals, integers, percents, greatest common factor, or least common multiple | * Had difficulties computing averages and means. |
| 5 | N&O | 2 | 15 | 85 | 6-4  Solves problems involving fractions, decimals, integers, percents, greatest common factor, or least common multiple | * Had difficulties doing operations with fractions and mixed numbers. |
| 6 | G&M | 2 | 23 | 77 | 6-3  Uses properties or attributes to identify, compare or describe three dimensional shapes | * Had difficulties to recognize and differentiate three dimensional shapes. |
| 7 | G&M | 2 | 15 | 85 | 6-5  Understands similarity | * Had difficulties with the concepts of similarity, area, and perimeter. |
| 8 | F&A | 1 | 37 | 63 | 6-3  Understands algebraic expressions | * Had difficulties with multiplication of decimals. |
| 9 | F&A | 1 | 20 | 80 | 6-4  Understands equality | * Had difficulties writing algebraic expressions from a words. |
| 10 | DS&P | 2 | 68 | 32 | 6-1  Interprets a given representation, circle graphs, linear graphs, steam-and-leaf-plots | * Had difficulties identifying the mode from frequency charts. |
| 11 | N&O | 1 | 0.2 | 99.8 | 6-2  Demonstrates understanding of the relative magnitude of numbers | * Had difficulties doing operations with fractions. |
| 12 | G&M | 1 | 0.3 | 99.7 | 6-3  Uses properties or attributes to identify, compare or describe three dimensional shapes | * Had difficulties with the concepts of prism, pyramids, and vertices. |
| 13 | G&M | 2 | 0.1 | 99.9 | 6-1  Uses properties or attributes of angles or sides to identify, describe, classify, triangles and quadrilaterals | * Had difficulties with definitions about triangles: obtuse, right, acute, scalene, equilateral, isosceles. |
| 14 | DS&P | 2 | 0.4 | 99.6 | 6-4  Uses counting techniques to solve problems: combinations and permutations | * Had difficulties doing combinations. |
| 15 | F&A | 3 | 1.1 | 98.9 | 6-3  Understands algebraic expressions | * Had difficulties evaluating an algebraic expression and solving an algebraic expression. |

**NECAP Question Analysis Grade 11**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Release Item** | **Strand** | **DOK** | **% of Students with Correct**  **Answer** | **% of Students with Incorrect**  **Answer** | **Grade Span Expectation**  **Students…** | **Error Analysis**  **Students…** |
| 1 | N&O | 2 | 20 | 80 | 10-2  Demonstrates understanding of the relative magnitude of numbers | * Had difficulties working with negative numbers and reciprocals. |
| 2 | N&O | 2 | 21 | 79 | 10-4  Understands proportional relationships using percents, ratios, and rates | * Had difficulties working with distance formula, *d=rt*, and/or solving an equation |
| 3 | G&M | 1 | 28 | 72 | 10-2  Creates formal proofs | * Had difficulties with the concept of counterexample. |
| 4 | G&M | 1 | 40 | 60 | 10-4  Applies concepts of congruency | * Had difficulties doing transformations in a coordinate plane. |
| 5 | G&M | 2 | 27 | 73 | 10-5  Applies concepts of similarity | * Had difficulties with the concept of similarity, and/or solving proportions |
| 6 | F&A | 2 | 53 | 47 | 10-1  Identifies, extends, and generalizes patterns | * Had difficulties recognizing patterns. |
| 7 | F&A | 1 | 36 | 64 | 10-2  Understands linear and nonlinear functions and relations | * Had difficulties with concepts of domain and range. |
| 8 | F&A | 1 | 11 | 89 | 10-3  Understands algebraic expressions | * Had difficulties working with exponents and linear binomials. |
| 9 | F&A | 1 | 33 | 67 | 10-4  Understands equality | * Had difficulties with the concept of perimeter and defining algebraic equations. |
| 10 | F&A | 2 | 32 | 68 | 10-4  Understands equality | * Had difficulties creating a system of equations and/or solving it. |
| 11 | DS&P | 2 | 50 | 50 | 10-1  Interprets a given representation | * Had difficulties analyzing data from graphic representations. |
| 12 | DS&P | 2 | 50 | 50 | 10-3  Describes elements that best display a given set of data or situation | * Had difficulties with the concept of median and/or analyzing data from graphic representations. |
| 13 | N&O | 2 | 0.0 | 100 | 10-2  Demonstrates understanding of the relative magnitude of numbers | * Had difficulties comparing rational and irrational numbers using the number line. |
| 14 | G&M | 1 | 0.4 | 99.6 | 10-2  Creates formal proofs | * Had difficulties finding angles from transversal lines. |
| 15 | G&M | 1 | 0.1 | 99.9 | 10-9  Solves problems on and off the coordinate plane | * Had difficulties recalling the midpoint formula |
| 16 | F&A | 2 | 0.0 | 100 | 10-1  Identifies, extends, and generalizes patterns | * Had difficulties writing and/or evaluating linear equations from a graph |
| 17 | F&A | 2 | 0.2 | 99.8 | 10-3  Understands algebraic expressions | * Had difficulties understanding algebraic equations. |
| 18 | F&A | 1 | 0.1 | 99.9 | 10-4  Understands equality | * Had difficulties solving two-steps algebraic equations with distribution |
| 19 | N&O | 3 | 0.0 | 100 | 10-2  Demonstrates understanding of the relative magnitude of numbers | * Had difficulties comparing rational and irrational numbers, and/or finding roots. |
| 20 | G&M | 2 | 0.2 | 99.8 | 10-6  Solves problems involving perimeter | * Had difficulties finding the volume of three dimensional shapes |
| 21 | DS&P | 3 | 0.1 | 99.9 | 10-2  Analyzes patterns, trends, or distributions of data | * Had difficulties with the concepts of mode, median, and mean. |
| 22 | G&M | 2 | 0.3 | 99.7 | 10-7  Uses units of measurement appropriately | * Had difficulties building equations from geometric graphs. |
| 23 | F&A | 2 | 1.0 | 99.0 | 10-2  Understands linear and nonlinear functions and relations | * Had difficulties interpreting linear graphs, finding slopes and y-intercepts. |

The tables above show that in grade 7, six out of fifteen questions address the strand Number & Operations, the GLEs covered are 6-1 once, 6-2 twice, 6-3 once, and also 6-4 twice. At grade 11, four from twenty three questions address the same strand, the GSEs covered are 10-2 three times and 10-4 once. Considering the percent of students with correct and incorrect answers for these questions it is clear that the math curriculum needs to address the teaching and practice of the standard N&O -2 related to the understanding of the relative magnitude of numbers.

Regarding the classroom assessment, before the District Curriculum Framework, math teachers in Hope High School as in the other high schools of the District used to use formative and summative assessments with attention in the units and not in the standards behind these units. Changes in this practice started five years ago with the introduction of NECAP as State assessment and professional developments for teachers concentrated in improving the understanding of the standards. Nevertheless, for many educators it still represents a challenge to change the way of instruction that has been used for several years. At Appendix # 1, this paper attaches three assessments used in Algebra 1 that addressed the strand Number & Operations 10-2 in 9th grade.

1. **Linkage to the of GLEs or GSEs to Instructional Tasks**

From the District Curriculum Framework, the table below shows that between 7th and 11th grades the standard N&O -2 is addressed and assessed in almost 10 units. In seven units through 7th and 8th grades, middle school. And in just two units in 9 grade before NECAP Test at 11th. During 10th grade, Geometry class, this standard is not addressed nor assessed.

**Instructional Task linked to GLEs and GSEs**

|  |  |  |
| --- | --- | --- |
| **Number of Times/ Grade** | **Unit Title/ Quarter / days** | **GLE / GSE Focal Point** |
| **Grade 7th** | **Adding and Subtracting Integers and Four Quadrant Graphics**  **Quarter 1**  **Unit 1**  **5 days** | M(N&O)–7–2 **Demonstrates understanding of the relative magnitude of numbers** by ordering,  comparing, or identifying equivalent rational numbers across number formats, numbers with whole number bases and whole number exponents (e.g., 33, 43), integers, absolute values, ~~or numbers represented in scientific notation~~ using number lines or equality and inequality symbols. (State) |
| **Grade 7th** | **Exponents Applications and Scientific Notation**  **Quarter 4**  **Unit 1**  **5 days** | M(N&O)–7–2 **Demonstrates understanding of the relative magnitude of numbers** by ordering,  comparing, or identifying ~~equivalent rational numbers across number formats, numbers with whole number bases and whole number exponents (e.g., 33, 43), integers, absolute values, or~~ numbers represented in scientific notation using number lines or equality and inequality symbols. (State) |
| **Grade 8th** | **Squares and Square Roots Quarter 2**  **Unit 3**  **10 days** | M(N&O)–8–2 **Demonstrates understanding of the relative magnitude of numbers** by ordering or comparing rational numbers, common irrational numbers (e.g., ,π ), ~~numbers with whole number or fractional bases and whole number exponents,~~ square roots, ~~absolute values, integers, or numbers represented in scientific notation~~ using number lines or equality and inequality symbols. (Local) |
| **Grade 8th** | **Using the Pythagorean Theorem**  **Quarter 2**  **Unit 5**  **6 days** | M(N&O)–8–2 **Demonstrates understanding of the relative magnitude of numbers** by ordering or comparing rational numbers, common irrational numbers (e.g., ,π ), ~~numbers with whole number or fractional bases and whole number exponents,~~ square roots~~, absolute values, integers, or numbers represented in scientific notation~~ using number lines or equality and inequality symbols. (Local) |
| **Grade 8th** | **Exponential Growth**  **Quarter 3**  **Unit 2**  **6 days** | M(N&O)–8–2 **Demonstrates understanding of the relative magnitude of ~~numbers~~** ~~by ordering or comparing rational numbers, common irrational numbers (e.g., ,π )~~, numbers with whole number or ~~fractional bases~~ and whole number exponents, ~~square roots, absolute values, integers~~, or numbers represented in scientific notation ~~using number lines or equality and inequality symbols~~. (Local) |
| **Grade 8th** | **Growth Patterns, Growth Factors, and Growth Rates**  **Quarter 3**  **Unit 3**  **6 days** | M(N&O)–8–2 **Demonstrates understanding of the relative magnitude of numbers** ~~by ordering or comparing rational numbers, common irrational numbers (e.g., ,π), numbers~~ with whole number or fractional bases and whole number exponents, ~~square roots, absolute values, integers, or numbers represented in scientific notation using number lines or equality and inequality symbols.~~ (Local) |
| **Grade 8th** | **Exponential Decay and Exponent Rules**  **Quarter 3**  **Unit 4**  **9 days** | M(N&O)–8–2 **Demonstrates understanding of the relative magnitude of numbers** ~~by ordering or~~  ~~comparing rational numbers, common irrational numbers (e.g., ,π )~~, numbers with whole number or fractional bases and whole number exponents, ~~square roots, absolute values, integers, or numbers represented in scientific notation using number lines or equality and inequality symbols~~. (Local) |
| **Grade 9th**  **Algebra 1** | **Real Numbers**  **Quarter 1**  **Unit 1**  **10 days** | M(N&O)–10–2 **Demonstrates understanding of the relative magnitude of real numbers** by solving  problems involving ordering or comparing rational numbers, common irrational numbers (e.g., ,π ),  rational bases with integer exponents, ~~square roots~~, absolute values, integers, ~~or numbers represented in~~  ~~scientific notation~~ using number lines or equality and inequality symbols. (State) |
| **Grade 9th**  **Algebra 1** | **Using Inequalities**  **Quarter 3**  **Unit 1**  **8 days** | M(N&O)–10–2 **Demonstrates understanding of the relative magnitude of real numbers** by solving  problems involving ordering or comparing rational numbers, common irrational numbers (e.g., ,π ),  rational bases with integer exponents, ~~square roots~~, absolute values, integers, or ~~numbers represented in~~  ~~scientific notation~~ using number lines or equality and inequality symbols. (State) |
| **Grade 9th**  **Algebra 1** | **Applying Exponents**  **Quarter 3**  **Unit 3**  **11 days** | M(N&O)–10–2 **Demonstrates understanding of the relative magnitude of real numbers** by solving  problems ~~involving ordering or comparing rational numbers, common irrational numbers (e.g., ,π )~~,  rational bases with integer exponents, square roots, ~~absolute values, integers~~, or numbers represented in  scientific notation ~~using number lines or equality and inequality symbols.~~ (State) |
| **Grade 10th**  **Geometry** | **This GSE is not addressed during this year** | **This GSE is not addressed during this year** |
| **Grade 11th**  **Algebra 2** | **Number and Operations**  **Quarter 1**  **Unit 2**  **NECAP Test schedule on October** | M(N&O)–12–2 **Demonstrates understanding of the relative magnitude of real numbers** by solving problems that involve ordering or comparing any subset of the real numbers.(Local) |

Considering that the strand Number & Operations represents 16% of the total points earned at the NECAP Test -11th grade, and that this particular standard is evaluated in three of the twenty three questions, one of the conclusions reached in writing this paper is that the District Curriculum Framework overestimates the students’ retention of knowledge of this standard based in the number of times that it is addressed and assessed before the Test. The low scores in the District for this strand can be explained by the lack of revision of this standard during the 10th grade, Geometry class. During the 10th grade, linking or not to the Geometry material the students should be able to review and refresh their knowledge about this particular standard. At Appendix # 2, this paper attaches three lesson plans to reach this objective.

1. **Curriculum Alignment**

Having students know basic facts and having students compute fluently continues to be an important goal in mathematics education. However, knowing basic facts should be incorporated into a rich mathematics curriculum that builds conceptual understanding of these facts. As students progress through the elementary grades and into middle school, they need to develop an in-depth conceptual understanding of fractions, decimals, and percents prior to doing algorithmic computations with these numbers. Conceptual development of integers and meaningful computation with them are also goals for middle grade students. The study of real number system, including irrational numbers and begins in eighth grade and continues through high school. A firm understanding of numbers as well as operations and their properties will provide a good foundation for the study of algebra. (Rhode Island Department of Education, 2007).

As the state struggles to align what is taught in the classroom with what is tested each year, Hope High School has similar problems. The school uses a block schedule, with four periods per day. Algebra 1 and Geometry, 9th and 10th classes run every day in 83 minutes period. Comparing this time of instruction with the other high schools that have periods of only 55 minutes, Hope has a major disposition of the time resource to address the District Curriculum Framework and other topics. And even with that advantage, the NECAP data shows low scores with the current 11th grade, in particular in the strand of Numbers & Operations.

Therefore, the proposal of this paper is to improve the use of time and curriculum at the school adding some lessons, formative assessment to address this standard in the Geometry curriculum (as samples show at Appendix #1 and Appendix # 2) , and fostering the practice of school homework during the summer. The extra lessons and assessments inside the Geometry curriculum would allow students practice and mastery of this standard and others prior to the administration of the NECAP. Also, through the assessment of these lessons students would be able to receive effective feedback regarding the specific skills that they need to master instead of just a grade. Finally, the idea of school homework during the summer is important because it sets the expectations of the class and the school. Students get the benefit of the practice and the sense of readiness for the next level of math. This practice will not be effective if only few teachers assign homework during the summer; it is a decision where the math department must act as a whole body to set up the culture and future expectations. The current situation is not good, 11th grade math teachers try to review all the material for NECAP from the beginning of classes on September until the day of the Test early on October, this paper shows that this practice does not work.

1. **Group Professional Development Plan**

Using SMART Goals this paper presents a plan to developed further discussion regarding curriculum and actions to improve student achievement and higher scores in Hope High School. Three SMART Goals are presented to introduce a Group Professional Development Plan. The first, addresses the need to share the results of this paper with the rest of the math department and the administration as well to model a beneficial new practice in the math department. The second SMART Goal, introduces the idea of homework during the summer for every math class as a method to prevent students from forgetting the material learned. Finally, the third SMART Goal, introduces the need of a continuous dialogue on how the District Curriculum Frame fits with the needs of the school.

**SMART Goal 1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Showing Project Outcomes to the Math Department**  **at Hope High School** | | | | |
| **SMART Goal** | **Strategies and Actions Steps** | **Responsibility** | **Timeline** | **Evidence of Effectiveness** |
| Reality: Few initiatives have been implemented by teachers from the math department that can benefit the school as a whole school. Usually the work done is individual aligning the teacher with his/her classes and the subjects that he/she covers.    Goal: It is to act as a model introducing the outcomes of this paper to the math department. Then, plan the implementation of lessons and assessments in the 10th grade regarding the standard N&O 2. | * Realize a force field analysis, addressing some math teachers to review the analysis made at the paper. * Coordinate with the head of the math department the presentation * Invite members of the SIT and administration to the meeting to maintain a clear communication and align common expectations. | Myself | Before the end of the second quarter. | If the consensus is reached, future NECAP scores  should show improvement in the strand N&O -2. |

**SMART Goal 2**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Homework During Summer**  **as a School Policy** | | | | |
| **Team SMART Goal** | **Strategies and Actions Steps** | **Responsibility** | **Timeline** | **Evidence of Effectiveness** |
| Reality: Give homework during the summer is a decision taken in isolation by each teacher. There is not a policy at the school to support or undermine the decision of a teacher. In resume, the students do not have clear expectations regarding this topic.  Goal: Introduce homework during summer as new policy of the math department at Hope High School. This practice decided as a group and by specific subjects can raise up the expectations of teaching and learning for the students and other teachers in the school. | * Realize a force field analysis, addressing some math teachers to review the analysis made at the paper. * Invite members of the SIT and administration to the departmental meetings to maintain a clear communication and align common expectations. | Teachers  Math Department  Principals  SIT | Ongoing, school year | A public record of these common initiatives considering initiation and quarterly review |

**SMART Goal 3**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Introduce Continuous Dialogue to Improve the District Curriculum Framework at**  **Hope High School?** | | | | |
| **Team SMART Goal** | **Strategies and Actions Steps** | **Responsibility** | **Timeline** | **Evidence of Effectiveness** |
| Reality: The math department uses its planning time working with District worksheets that have as objective generate common understanding and use of the District Curriculum Framework.  Goal: The math department should establish as a routine constant presentation where working in pairs and using data, teachers are push to present different approaches to improve the student learning and NECAP scores based in the characteristics of the school. | * Administration and guidance manage information about student scores in different test. The access to this information can determine the success of the goal. * Invite members of the SIT and administration to the departmental meetings to maintain a clear communication and align common expectations. * SIT could monitor and support practices approved. | Guidance  Teachers  Principals  SIT | Ongoing, school year | A public record of these common initiatives considering initiation and quarterly review |

**Bibliography**

* Borg, L. (2009, September 24). R.I. students lag on state wide science test. *Providence Journal* .
* Jordan, J. (2009, January 23). Rhode Island high school students lag in math. *Providence Journal* .
* National Center for Education Statistics. (2009). *Mathematics 2009 - Snapshop State Report*. Retrieved November 20, 2009, from The Nations Report Card: http://nces.ed.gov/nationsreportcard/pdf/stt2009/2010454RI4.pdf
* Rhode Island Department of Education. (2007, August 2). *NECAP and local mathematics Grade Level Expectations for grades K-8 (GLEs) .* Retrieved December 2009, from Rhode Island Department of Education: http://www.ride.ri.gov/Instruction/gle.aspx#math
* Rhode Island Department of Education. (2008, December). *Standards for Educational Leadership in Rhode Island.* Retrieved November 2009, from Rhode Island Department of Education: http://www.ride.ri.gov/EducatorQuality/DOCS/General\_Documents/PDF/Leadership%20Standards%201.29.2009.pdf

**Appendix # 1: Assessments**

**Assessment 1:**

M(N&O)–10–2 **Demonstrates understanding of the relative magnitude of real numbers** by solving problems involving ordering or comparing rational numbers, common irrational numbers (e.g., ,π ), rational bases with integer exponents, ~~square roots~~, absolute values, integers, ~~or numbers represented in scientific notation~~ using number lines or equality and inequality symbols. (State)



**Assessment 2:**

M(N&O)–10–2 **Demonstrates understanding of the relative magnitude of real numbers** by solving problems involving ordering or comparing rational numbers, common irrational numbers (e.g., ,π ), rational bases with integer exponents, ~~square roots~~, absolute values, integers, ~~or numbers represented in scientific notation~~ using number lines or equality and inequality symbols. (State)



**Assessment 3:**

M(N&O)–10–2 **Demonstrates understanding of the relative magnitude of real numbers** by solving problems ~~involving ordering or comparing rational numbers, common irrational numbers (e.g., ,π )~~, rational bases with integer exponents, square roots, ~~absolute values, integers~~, or numbers represented in scientific notation ~~using number lines or equality and inequality symbols.~~ (State)



**Appendix # 2: Lessons Plans**

**Lesson Plan 1**

Title: Real Numbers

Objectives:

* Classify and use real numbers

GLE M(N&O)–8–2

Vocabulary:

* positive number
* negative number
* natural number
* whole number
* integer
* rational number
* irrational number
* square root
* perfect square

Scaffolding Activities:

* Show and practice how to classify real numbers
* How to graph numbers on a number line.
* Instruct students to be consistent with the scales on their number lines. Show tick marks at equal intervals
* Show how to write repeating decimals as a fractions
* Show how to simplify expressions involving square roots
* Show how to estimate square roots to the nearest whole number

Assessment

* Use a worksheet to assess student understanding of real numbers
* Ask students to write and differentiate two rational and irrational numbers

**Lesson Plan 2**

Title: Adding, Subtracting, Multiplying and Dividing Rational Numbers

Objectives:

* Add, subtract, multiply, and divide Rational Numbers

GSE M(N&O)–10–2

Vocabulary:

* rational number
* irrational number
* multiplicative inverse
* reciprocal

Scaffolding Activities (two periods may be used to review all material):

* Show how to compare rational numbers
* Show how to order rational numbers
* Show how to find the sum and difference of fractions with like denominators
* Show how to find the sum and difference of fractions with unlike denominators
* Show how to use number line to add rational numbers
* Show how to find the sum of rational numbers
* Show how to subtract rational numbers
* Show how to find the product or the quotient of decimals with the same signs or different signs
* Show how to find the product of fractions
* Show how to find the product of fractions with different signs
* Show how to find the reciprocal of a number
* Show how to divide fractions

Assessment

* Use worksheet(s) to assess student understanding of operations with rational numbers

**Lesson Plan 3**

Title: Number of Operations

Objectives:

* Evaluate numerical expressions by using order of operations
* Evaluate algebraic expressions by using order of operations

GSE M(N&O)–10–2

Vocabulary:

* Evaluate
* Order of Operations

Scaffolding Questions:

* How would you translate 4(64.95)+ 3(53.95)?
* What are the operations in the expressions?
* What does 4(64.95)?
* Indicate that grouping symbols are used to clarify or change the order of operations
* Explain the importance of grouping symbols when working with a calculator
* A fraction bar is considered as a grouping symbol. Thus, it is important to evaluate numerator and denominator before completing the division
* Use few problems to assess student’s understanding after each example
* Take time explaining complex algebraic expressions

Assessment

* Use worksheet(s) to assess student understanding of operations with rational numbers
* Student can work in pair to check their work and final answers